Organization of Mechanized Coal Mining in Trudovskaya Mine No 5

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MECHANIZED COAL MINING AT TRUDOVSKAYA SHAFT NO 5

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[Tables are appended.]

At Trudovskaya shaft No 5 of the Stalinugol' Trust of the Stalinugol' Combine (Donbass), the basic operational coal deposit, the K_8 Semenov deposit, is of medium toughness. Its thickness within the field range controlled by the shaft is 1-1.1 meters; its angle of dip is 12 degrees. Stable limestones is embedded in the roof of the coal deposit to a thickness of 3 meters, while the floor of the deposit contains heaving argillaceous shale. In some places, argillaceous shale pseudo-roof formations are encountered, occupying a depth of 0.01-0.04 meters. The structure of this stratum is shown in Figure 1.

Work is conducted alongside for bringing into operating range the ℓ_3 Almaznyy deposit. A haulage crosscut has already been driven, and a ventilation crosscut is being driven.

The longwall method of mining is used, with individual chambers-stories along the continuous wall of coal. Two chambers are in operation along the K_8 stratum: No 6 West and No 6 East, with the mining and geological conditions in both being the same.

The length of chamber No 6 West is 215 meters. The roof control in the chamber is maintained by its gradual lowering with the aid of wood chocks. The distance between the chocks

along the dip of the deposit is two meters. The working space is braced into a frame propped by two timber columns, sections of which are sawed to size along the dip of the seam. The distance between the frames along the dip of the coal seam is one meter, and along the run of the coal seam 1.6 meters.

Above the haulage crosscut, a pillar of coal 25x30 meters in cross section is left intact. Over the ventilation crosscut, a strip 12 meters wide is laid out with rubblestone (see Figure 2).

The cutting and the piling of coal in the chamber is effected with the aid of two Donbass coal-cutter combines. The length of the cutting bar is 1.6 meters. The lower combine cuts and loads the coal in the lower part of the chamber until it reaches the niche that was preliminarily prepared in the middle part of the chamber. The upper coal-cutter combine mines the coal over a distance beginning with the niche until it reaches the ventilation crosscut.

The mined coal is transported by SKR-11 scraper conveyors. Three such conveyors operate along the chamber, one in the cross-hole and one in the working stope (opening up into the haulage crosscut).

As can be seen from the graph of operations of the West chamber (Figure 3), the first shift is devoted entirely to maintenance, repair, and setup, while the second and third shifts are engaged in the actual extraction of coal.

The first shift is made up by a group of 21: the coal-

cutter operator and his two helpers, 10 conveyor carriers, 4 electricians, and 4 mine-timber mechanics. At the beginning of the shift, the upper combine is located at a distance of 3-4 meters from the upper studdle of the operating chamber. The machine operator and his two helpers get the machine ready for lowering toward the middle niche (a distance of 110 meters). This takes 1-1.5 hours. The lowering of the combine takes 2-2.5 hours. When the combine arrives at the middle niche, it is mounted and made ready: the cutting bar is set, the automatic loader is connected, lubrication is attended to, the cable is rigged, and the entire aggregate is tested under load. The entire operation of lowering and setting up of the combine consumes 4 hours.

The transfer of the conveyors is organized as follows. When the carrier brigade arrives in the operating chamber, two men go up to the tension head for the lower conveyor frame, reduce the tension in the chain of this head, and proceed to the tension head of the middle frame. Two men following them remove the upper chain along the entire length of the conveyor up to the tension head. Then two men, coming upward, remove the upper conveyor chutes, setting them down up-edge. Following downward, four men carry the lower conveyor chutes to the new track. Upon removing the chain and detaching the conveyor chutes from the driving head, four men transfer this rigging onto the new track. After arranging the lower chutes, one man adjusts the lower chain, two men adjust the upper chutes, and one man the upper chain. In the same order of sequence, the transfer of the middle and upper conveyor sections is effected.

The transfer of the conveyor line, which consists of three sections, accounts for the entire time of the shift.

Following the transfer of the conveyors, the timbermen remove the wooden chocks and transfer them by a step of one cycle.

The ventilation crosscut brigade, consisting of three men, is engaged in drilling from 0700 to 0800 hours, in blasting from 0800 to 0830 hours, and in laying a 12-meter rubble-stone up to the end of the shift.

The second shift (extraction shift) consists of 24 men: the operator of the coal-cutter combine and his two helpers, three timber framers, two electricians, four motormen, 10 stope-and-niche maintenance men, and two mine-car operators. At the beginning of the shift, the lower coal-cutter combine is in the lower niche. In the process of extracting coal during the shift, it reaches the middle niche. During this time, 220 tons of coal is passed. In the wake of the advancing combine, the working stope is cleared of overhang lumps, the track of the combine is kept clear, and the work space braced with mine timbers.

The third shift (extraction shift) consists of 28 men: the coal-cutter combine operator and his two helpers, three timber framers, four timber haulers, two electricians, two mine-car operators, four motormen, and 10 stope-and-niche maintenance men. At the beginning of the shift, the upper coal-cutter combine, which is in the middle niche, is made ready for work. During the shift, it extracts coal up to the upper studdle of the chamber amounting to 220 tons. The stope

maintenance men remove the hangings, clear the track, and prepare the niches. In the wake of the moving coal combine, three timber men brace the working space. During the same shift, the timber haulers deliver from up above the bracing timbers necessary for the complete cycle. At 0400-0500 in the morning, the coal combine operator and his two helpers lower the bottom combine, setting it up in the bottom niche; they set the cutting bar, attach the loader, lubricate the combine, rig the cable, and test the combine under load. The lowering and the setting up of the bottom combine takes up 4 hours.

The complete cycle of operations is repeated every 24 hours.

The haulage crosscuts underneath the working chambers are driven in narrow-pass double-path cross sections, with the aid of EPM-1 rock-loading machines. The rational organization of crosscut tunneling resulted in crosscut advances up to 180-190 meters.

In order to make the conveyor operation continuous, the loading station of the mining chamber is equipped with a special bin, the capacity of which equals half a mine-car load. The presence of this bein makes the delivery of the coal from the mining chamber to the crosscut a rythmic operation, necessitating no stoppages for the conveyor. The mine-car rolling stock, ready for loading, is strung out under the hatch without uncoupling, with the aid of a low-speed remote-control MK-3 hoist. Only one man is in charge of the loading station.

Haulage along the crosscuts is effected by II-TR-2

electric trolley locomotives, two locomotives servicing each mining chamber. The mine-train traffic is so calculated as to provide for continuous presence of empty mine cars underneath the mining chambers and the timely hauling away of the loaded mine cars from the mining chamber.

The considerable advance stretches of crosscuts permitted the laying out of rail sidings up to 150 meters long right at the loading stations of the mining chambers. This provides for a corresponding maneuverability of the electric locomotives at the chambers. Because of the considerable length of the haulage path from the mining chamber to the mine chute (1,400 meters), the middle part of the crosscut is provided with an additional rail siding. This provides an arrangement of the mine-car train traffic between the mining chamber and the mine chute such that the empty and loaded trains, encountering each other at the siding, lose no time in waiting. The movement of the electrically-hauled trains along the crosscuts is strictly in accordance with the traffic diagram laid out for this purpose.

The mechanization of marshalling operations has considerably increased the productivity of the electric locomotives, having eliminated the idling periods under the mining chambers for the coupling and uncoupling of the mine cars.

Haulage along the central (Semenov) mine chute is effected by an endless cable with the aid of an OL-9 mine hoist.

In order to reduce the labor consumption of the auxiliary operations at the bottom receiving platform of the mine chute, the incoming loads of coal and rock are transferred by electric

locomotives onto special auxiliary platforms tapering off into downgrades. The mine cars are uncoupled and, with the aid of a remote-control low-speed MK-3 hoist, are individually shunted in a continuous run by way of the auxiliary platforms to the top of the downgrade.

The mine cars, loaded with coal and rock, are then detached from the endless cable control and allowed to roll by gravity to the endless cable receiving station of the mine marshalling yard. The mine stockyard is single-ended and is equipped for the feeding of loads to the mine shaft and empty mine cars to the mine chute (with the aid of an OL-1 hoist).

As a result of effecting the above described complete mechanization and of the arrangement of the extraction work in the mine chamber in accordance with a 24 hour-cycle diagram, the jobs of 36 conveyor-loading miners, eight mine-car attendants, and three slab muckers were eliminated, effecting a monthly saving of 55,240 rubles (2 rubles 65 kopecks per ton of coal mined).

The technical and economic indexes of the operation of the mine, prior to its conversion to complex mechanization and cycle operation, and also following the same, are cited in Table 1 below.

TABLE 1

It follows from this Table that the monthly headway of the operating chambers along the coal seam, No 6 West and No 6 East, respectively, increased 35 and 16 percent, and the monthly output 21 and 14 percent.

The output of the coal-cutting combines in February 1950, for the entire shaft operation, was 5,009 tons. In March 1951 it was 5,843 tons against 5,240 tons (as per plan), and in April it was 5,890 tons against 5,303 tons (as per plan). Data on the increased monthly output per miner is cited in Table 2 (before the war, the monthly output of a miner, computed for the entire shaft operation, was 31.6 tons).

In August 1950, 22,960 tons of coal was mined, and in March 1951 -- 26,602 tons.

Due to the conversion of the entire shaft operation to complete mechanization, and the adaptation of the operating chambers to the 24-hour cycle, the State Plan coal-mining quotas are regularly overfulfilled. In August 1950, the plan was fulfilled 105.8 percent; in January 1951, 105.5 percent; and in July 1951, 109.4 percent. Thus, conditions were created providing for the maximum utilization of new machinery and equipment.

TABLE 2

In Table 3 below, data on the fulfillment of the cycle-of-operations norm is cited.

TABLE 3

It follows from Table 3 that operating chamber No 6 East, which previously did not fulfill the established cycle of operations norm on account of a shortage in empty mine dump cars, has overcome the difficulties and fulfilled the cycle of operations norm in March and April 1951.

During the month of May, chamber No 6 East showed a drop in the operating indexes, due to a sharply deteriorated condition of the coal seam roof.

In order to insure the uninterrupted operation of the mine chambers in accordance with the 24-hour cycle diagram, it was decided to step up the work of completing the equipment of the prospecting pit so that auxiliary operations, such as the entrance and exit of men, materials, and equipment, could be conducted through this pit, thereby relieving the main shaft of the excessive load and assigning it to the handling of coal exclusively. When the prospecting pit is fully equipped, the main shaft will be in a condition to handle mined coal for 3 more hours per day, thereby raising the daily output of the shaft 150-170 tons.

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TABLE 1

Index	August 1950		March 1951	
	No 6 West Chamber	No 6 East Chamber	No 6 West Chamber	No 6 East Chamber
Length of Chamber (meters)	200	190	215	190
Thickness of Seam (meters)	1.1	1.1	1.1	1.1
Monthly Chamber Headway (meters)	33.2	33.0	45.0	38.2
Effective crosscut Depth (meters)	1.45	1.45	1.45	1.45
Number of Operating Cycles per Month	23.7	--	31.0	26.4
Coal Seam Yield in Tons per Square Meter	1.4	1.4	1.4	1.4
Monthly Production of One Operating Chamber (tons)	11,140	8,897	13,237	10,137
Miner productivity by Chamber Output (tons)	5.87	--	5.91	4.24

TABLE 2

Objective	August 1950		January 1951		February 1951		March 1951	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Chamber No 6 West	74.8	73.4	73.9	77.6	71.8	82.4	85.3	92.7
Chamber No 6 East	56.2	47.1	57.8	53.0	57.0	58.1	68.0	65.3
Shaft Operation as a Whole	28.0	28.1	27.1	28.6	26.9	28.7	30.5	32.8

TABLE 3

	August 1950		January 1951		February 1951		March 1951		April 1951		May 1951	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Chamber No 6 West	26.4	23.7	24.7	24.5	23.8	28.3	26.4	31.0	27.0	31.7	26.1	29.0
Chamber No 6 East	---	---	24.7	21.9	23.8	21.4	26.4	26.4	26.5	26.5	24.7	22.8

TABLE 3

	August 1950		January 1951		February 1951		March 1951		April 1951		May 1951	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Chamber No 6 West	26.4	23.7	24.7	24.5	23.8	28.3	26.4	31.0	27.0	31.7	26.1	29.0
Chamber No 6 East	---	---	24.7	21.9	23.8	21.4	26.4	26.4	26.5	26.5	24.7	22.8